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**Tarra et al.**

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(54) **MEDIA STREAMING DEVICE WITH GATEWAY FUNCTIONALITY**

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*H04L 29/02* (2006.01)

(52) **U.S. Cl.**
USPC ..... **370/401**; 370/252

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See application file for complete search history.

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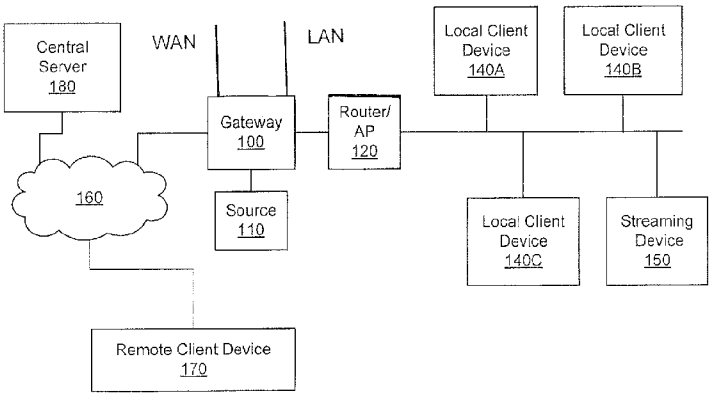
(57) **ABSTRACT**

Various methods and devices provide place shifting of a media stream to a remote device while also providing network functionality for a local area network (LAN) and/or a wide area network (WAN). The gateway includes a media interface for receiving audio/visual (A/V) signals from the media source, as well as interfaces to the LAN and/or the WAN. A media streaming module receives the A/V signals from the media interface and processes the received A/V signals to thereby create the media stream. A modem module receives the media stream from the media streaming module via a dedicated connection, network switch and/or other connection, and transmits the media stream to the remote device via at least one of the first and second network interfaces.

**16 Claims, 2 Drawing Sheets**



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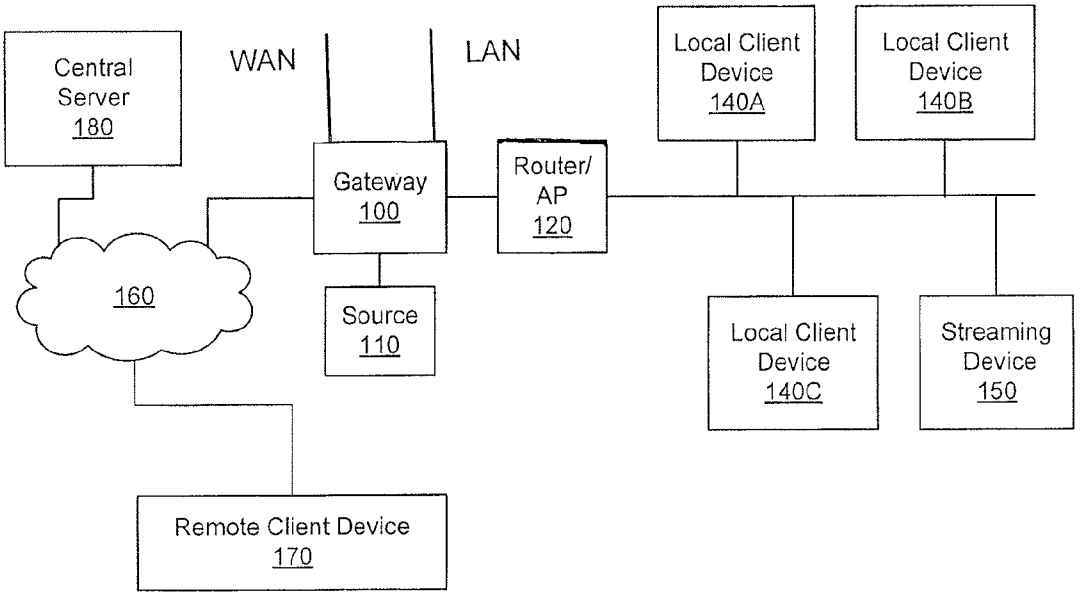
Central Server 180
WAN
LAN
Local Client Device 140A
Local Client Device 140B
Gateway 100
Router/ AP 120
160
Source 110
Local Client Device 140C
Streaming Device 150
Remote Client Device 170

FIG. 1

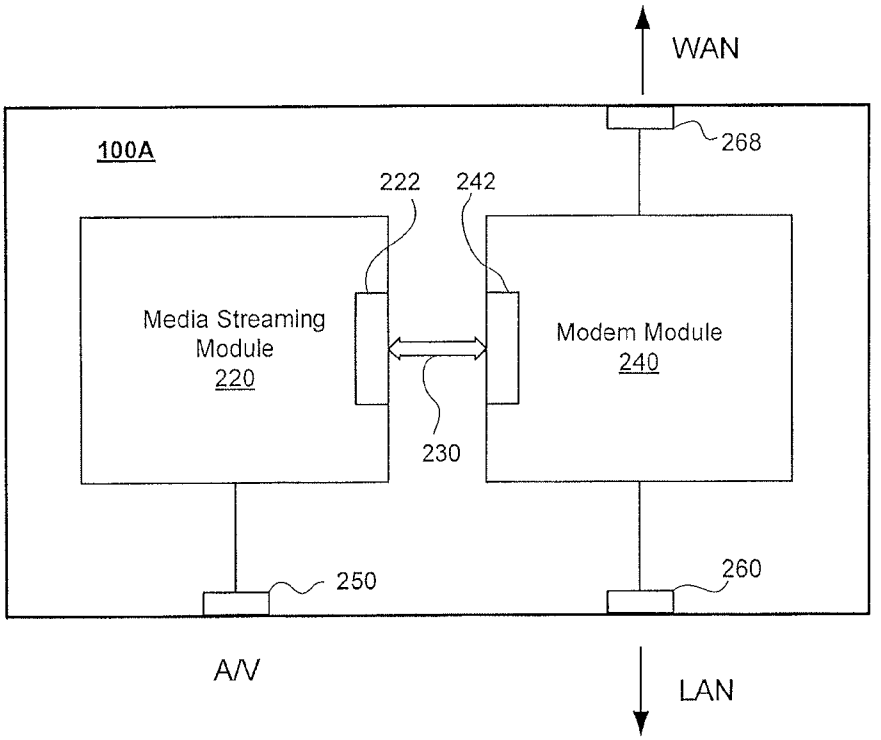
WAN
100A
268
222
242
Media Streaming Module 220
Modem Module 240
230
250
260
A/V
LAN

FIG. 2

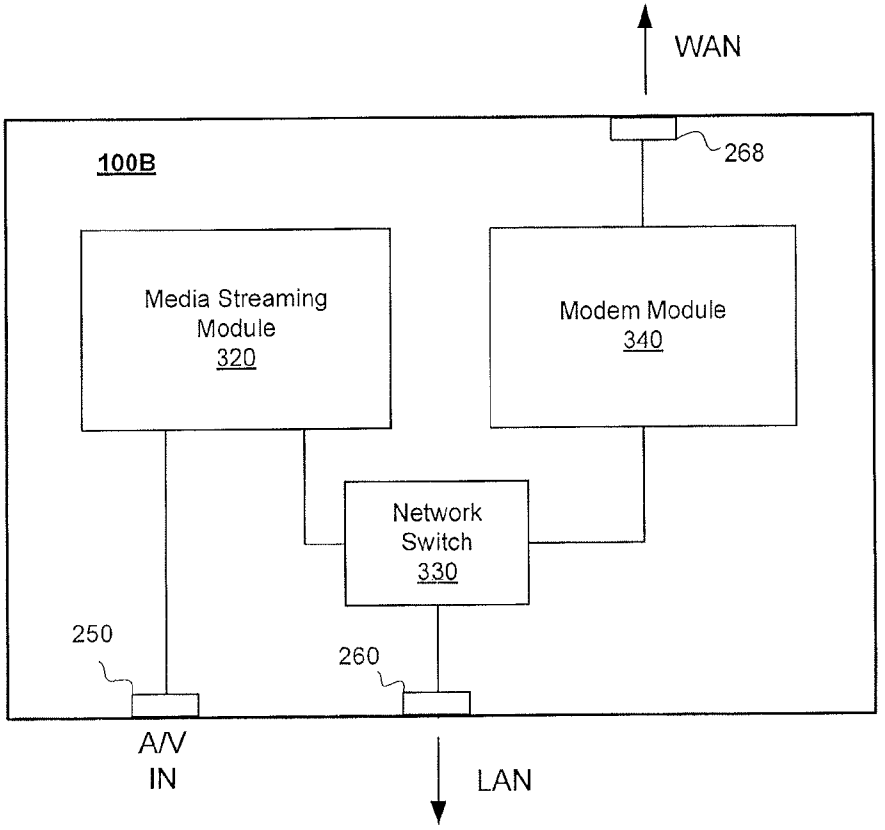
WAN
100B
268
Media Streaming Module 320
Modem Module 340
Network Switch 330
250
260
A/V IN
LAN

FIG. 3

# MEDIA STREAMING DEVICE WITH GATEWAY FUNCTIONALITY

## PRIORITY CLAIM

This application claims priority to U.S. Provisional Patent Application Ser. No. 60/975,239, entitled "Media Streaming Device with Gateway Functionality" and filed on Sep. 26, 2007, which is incorporated herein by reference.

## TECHNICAL FIELD

This application generally relates to devices and techniques for streaming audio/visual content over a network, such as media place shifting devices.

## BACKGROUND

Media streaming devices enable users to view audio-visual (A/V) content from their cable, satellite, television or recording devices over a home network or the Internet. The media streaming devices typically connect to a network and stream the A/V content through the network to a client device (e.g., televisions and personal computers). Users may view the A/V content at various locations using the same or different client devices. The media streaming device may be located within the same local area network (LAN) as the client devices or the media streaming device may be located outside the LAN where the client devices resides.

Regardless of whether the media streaming devices are located in the same LAN as the client devices or outside the LAN, the user typically configures the media streaming devices to communicate with the client devices via networks. The configuration procedure includes setting various parameters and options associated with a modem or other network access device. The configuration procedure may involve detailed knowledge about the network structure and may therefore cause frustration on the part of the users, especially if the users have limited or no network configuration skills. Further, the media streaming devices may also have multiple connectors for various discrete communication channels. In such cases, the user typically also enables or disables these connectors depending on the configuration of the network surrounding the media streaming devices.

Accordingly, the process of installing and configuring the media streaming devices to work in a network environment may be a demanding and time consuming task for the users that can impede wider deployment of the media streaming devices.

## BRIEF SUMMARY

Various methods and devices provide place shifting of a media stream to a remote device while also providing gateway functionality between a local area network (LAN) and/or a wide area network (WAN). The gateway includes a media interface for receiving audio/visual (A/V) signals from the media source, as well as interfaces to the LAN and/or the WAN. A media streaming module receives the A/V signals from the media interface and processes the received A/V signals to thereby create the media stream. The media stream is then transmitted to the remote device via the network interface.

In other embodiments, a method is provided for transmitting a network stream representing audio/visual signals received from a media source to a remote device using a device that comprises a first module and a second module that provides communications between a local area network and/or a wide area network. The method comprises receiving the audio/visual signals from the media source, and processing the audio/visual signals to create the media stream at the media streaming module. The network stream is provided from the first module to the second module, and transmitted to the remote device via at least one of the local area network and/or the wide area network.

In still other embodiments, a gateway device interfacing with a local area network and a wide area network additionally provides a media stream to a remote device in response to audio/visual signals received from a media source. The gateway device comprises a media interface configured for receiving the audio/visual signals from the media source, as well as a first network interface to the local area network and a second network interface to the wide area network. A modem module is configured to provide communication between the first and second network interface, wherein the modem module is further configured to obtain a network address that was previously allocated to another device operating on the local area network and to use the previously-allocated network address during subsequent communications on the wide area network. A media streaming module is configured to receive the audio/visual signals from the media interface, to process audio/visual signals to create the media stream, and to transmit the media stream to the modem module for transmission to the remote device via at least one of the local area or the wide area network.

Various other embodiments, aspects and other features are described in more detail below.



## BRIEF DESCRIPTION OF THE DRAWING FIGURES

Exemplary embodiments will hereinafter be described in conjunction with the following drawing figures, wherein like numerals denote like elements, and

FIG. **1** is an overall schematic diagram of an exemplary system including a gateway device;

FIG. **2** is a block diagram of an exemplary gateway device according to one embodiment; and

FIG. **3** is a block diagram of an exemplary gateway device according to another embodiment.

## DETAILED DESCRIPTION

The following detailed description of the invention is merely exemplary in nature and is not intended to limit the invention or the application and uses of the invention. Furthermore, there is no intention to be bound by any theory presented in the preceding background or the following detailed description.

Overall Network Architecture

Various embodiments provide a gateway device with media streaming device functionality. The gateway device controls access from a local area network (LAN) to a wide area network (WAN) and vice-versa. In various embodiments, the gateway device disguises itself as a router or other network device within the LAN by using the media access control (MAC) address of the router or other network devices (e.g., local client devices or streaming devices) in the LAN. The gateway device can also use the same Internet Protocol (IP) address allocated to the router or other network devices in the LAN. Some embodiments of the gateway device also discover other media streaming devices installed in the LAN by capturing discovery requests from local client devices to the WAN and extracting information of the local client

devices from the discovery packets. Various gateway devices may also selectively enable or disable their connectors after detecting the presence of signals in the connectors. Such gateway devices may therefore function as media streaming devices (without gateway functionality) if signals are not detected in the WAN connection. In another mode of operation, the device may disable media streaming and simply act as a gateway device.

FIG. **1** illustrates an overall schematic diagram of a system including a gateway device **100**, according to one embodiment. The gateway device **100** is an access point to the WAN for the local client devices **140**A-C and any other streaming devices **150** in the LAN. The WAN may, for example, be implemented by Public Switched Telephone Network (PSTN), cable or satellite television infrastructure, General Packet Radio Service (GPRS), third-generation (3G) mobile, High Speed Download Packet Access (HSDPA), Worldwide Interoperability for Microwave Access (WiMAX), and/or the like. The WAN may include, among other network components, a central server **180** and a remote client device **170**. The remote client device **170** may receive media streams created by the gateway device **100** via the WAN and play the A/V content decoded from the media streams. In such embodiments, LAN entities **140**A-C and **150** may or may not be present.

In one embodiment, a central server **180** is coupled to the remote network **160** and provides one or more roles, including that of a domain name server (DNS). In order to provide a consistent method of accessing the LAN, the central server **180** may assign a DNS name to the gateway device and may correlate that DNS name to the dynamic IP address allocated to the user as described, for example, in U.S. patent application Ser. No. 11/147,664 entitled "Personal Media Broadcasting System," filed on Jun. 7, 2005 (now published as US Patent Publication No. 2006/0095471), which is incorporated by reference herein in its entirety.

The LAN may, for example, be implemented by Ethernet, Wireless Fidelity (Wi-Fi), powerline Ethernet, any combination of these technologies, and/or any other local area network as appropriate. The local area network may include one or more local client devices **140**A-C. The local devices **140**A-C include devices such as personal computers or televisions that may communicate with the gateway **100** or the streaming device **150** to decode and play the media stream sent by the gateway **100** or the local streaming device **150**. The LAN may be coordinated and managed by one or more routers (and/or access point(s)) **120**. In one embodiment, the router (or access module) **120** is integrated with the gateway device **100**.

The gateway device **100** may also be coupled to a media source **110** for receiving the A/V signals. The media source **110** may include any of various devices including, among other devices, cable set-top boxes, satellite set-top boxes, DVD players, digital video recorders (DVRs), videocassette recorders (VCRs), and television receivers. The gateway device **100** processes the A/V signals for transmission, as described below with reference to FIG. **2**.

Gateway Device Architecture

FIG. **2** illustrates a block diagram of the gateway device **100**A, according to one embodiment. The gateway device **100**A includes a media streaming module **220**, and a modem module **240**. The media streaming module **220** receives the A/V signals from the source **110** via an A/V input **250**, and processes the A/V signals for transmission to the local client device **140**A-C or the remote client device **170** as described, for example, in U.S. patent application Ser. No. 11/147,664 entitled "Personal Media Broadcasting System," filed on Jun. 7, 2005 (now published as US Patent Publication No. 2006/0095471). The modem module **240** communicates with the WAN via a WAN connector **268**. The modem module **240** communicates with the LAN via a LAN connector **260**.

The A/V input **250** may be either analog or digital inputs including, for example, component video, High-Definition Multimedia Interface (HDMI), an S-video, Digital Visual Interface (DVI), IEEE 1394, Universal Serial Bus (USB), Serial Digital Interface (SDI), Toslink optical, or composite coax digital audio. The gateway device **100**A may be provided with one or more A/V input connectors of the same type or different types.

The modem module **240** functions to provide communication between the LAN and the WAN. The modem module **240** modulates signals received from the LAN to signals for transmission over the WAN and/or demodulates signals from the WAN to signals for transmission to the LAN. In one embodiment, the modem module **240** is a cable modem providing communication over the cable television infrastructure. The LAN connector **260** and the router (or access point) **120** may be connected via cables such as an Ethernet cable.

The media streaming module **220** and the modem module **240** communicate via a dedicated communication channel **230**. In one embodiment, the communication channel **230** is implemented using a host-port interface (HPI) and a counterpart external memory interface (EMIF). The HPI and the EMIF form a HPI-EMIF bridge. In one embodiment, the interface **222** of the media streaming module **220** is implemented as the HPI, and the interface **242** of the modem module **240** is implemented as EMIF. The interface module **222** encapsulates the TCP/IP packets or Ethernet packets into HpiEmifPackets or decapsulates the HpiEmifPackets into the TCP/IP packets or Ethernet packets. Likewise, the modem module **240** includes an interface module **242** for receiving and decapsulating the HpiEmifPackets to the TCP/IP packets or Ethernet packets, and encapsulating the TCP/IP packets or Ethernet packets to the HpiEmifPackets. In another embodiment, a communication channel between the modem module **240** and the LAN is shared for communicating between the media streaming module **220** and the modem module **240**, as explained in detail below with reference to FIG. **3**.

In one embodiment, the media streaming module **220** generates TCP/IP packets or Ethernet packets based on the A/V signals received via the A/V input **250**, as described, for example, in U.S. patent application Ser. No. 11/147,664 entitled "Personal Media Broadcasting System," filed on Jun. 7, 2005 (now published as US Patent Publication No. 2006/0095471). Then the interface **222** encapsulates the TCP/IP packets or Ethernet packets into the HpiEmifPackets for transmission over the HPI-EMIF bridge **230**. Likewise, any data to be transmitted from the modem module **240** to the media streaming module **220** is encapsulated into HpiEmifPackets for transmission over the HPI-EMIF bridge **230**. Then, the HpiEmifPackets from the modem module **240** is decapsulated at the media streaming module **220**.

To enable the media streaming module **220** to communicate via the modem module **240**, synchronization information is exchanged when the gateway device **100**A is activated or restarted. Also, the media streaming module **220** configures the modem module **240** to send certain packets received via the WAN or the LAN to the media streaming module **220** via the HPI-EMIF bridge **230**. The media streaming module **220** also configures the media streaming module **220** to inform certain changes in the modem module **240** to the media streaming module, and sends instructions to configure the modem module **240** so that the modem module **240** functions as a conduit for the media streaming module **220**.

The modem module **240** may transmit the A/V signals from the media streaming module **220** to the WAN or the LAN. Specifically, after the modem module **240** receives the A/V signals from the media streaming module **220** via the interface **222** and the HPI-EMIF bridge **230**, the interface **242** converts the HpiEmifPackets from the media streaming module **220** back to the TCP/IP packets. The modem module **230** then inserts the TCP/IP packets in packet streams sent to the WAN or the LAN or both.

In one embodiment, the HPI-EMIF bridge **230** also transmits packets from the modem module **240** to the media streaming module **220**. The modem module **240** filters the TCP/IP packets or Ethernet packets from the LAN or the WAN that needs to be transmitted to the media streaming module **220**. The filtered TCP/IP packets are then converted to the HpiEmifPackets by the interface module **242** for transmission to the media streaming module **220** over the HPI-EMIF bridge **230**. The interface **222** of the media streaming module **220** then converts the HpiEmifPackets into the TCP/IP packets for further processing. The TCP/IP packets may then be processed as describe, for example, in U.S. patent application Ser. No. 11/147,664 entitled "Personal Media Broadcasting System," filed on Jun. 7, 2005 (now published as US Patent Publication No. 2006/0095471).

By providing the HPI-EMIF bridge **230** dedicated for communication between the media streaming module **220** and the modem module **240**, the modem module **240** may perform its gateway functions without added communication traffic between the media streaming module **220** and the modem module **240**. Also, using the interface modules **222**, **242** in conjunction with the HPI-EMIF bridge **230** enables essentially the same media streaming module **220** of a personal streaming module operable in the LAN environment to be used in the gateway device **100**A.

In one or more embodiments, shared memory in the form of an EMIF-EMIF bridge may also be used to connect the streaming module **220** and the modem module **240**.

FIG. **3** is a block diagram illustrating a gateway device **100**B according to another embodiment. The embodiment of FIG. **3** is substantially the same as the embodiment of FIG. **2** except that there is no dedicated communication channel between the media streaming module **320** and the modem module **340**. Instead, a network switch **330** is provided to switch a shared communication channel. Specifically, the network switch **330** switches the communication path between the media streaming module **320**, the modem module **340**, and the router (or access point) **120**. The network switch **330** has two modes: the internal communication mode and the external communication mode. In the internal communication mode, the network switch **330** opens a communication channel between the media streaming module **320** and the modem module **340**. In the external communication mode, the network switch **330** opens a communication channel between the router (or access point) **120** and the modem module **340**.

In one embodiment, the modem module **340** receives and stores TCP/IP packets or Ethernet packets from the media streaming module **320** in the internal communication mode. In a subsequent external communication mode, the modem module **340** inserts the TCP/IP packets or Ethernet packets from the media streaming module **320** into the packet streams sent to the LAN or the WAN.

In one embodiment, the modem module **340** receives TCP/IP packets or Ethernet packets for transmission to the media streaming module **320** from the router (or access module) **120** and stores the packets. In a subsequent internal communication mode, the modem module **340** sends the stored packets to the media streaming module **320** via the network switch **330**.

The timing for each mode may be controlled based on the amount of network traffic exchanged between the two networks (the WAN and the LAN), and the two modules **320**, **340**.

IP/Mac Address Spoofing

In one embodiment, the modem module **220**, **320** of the gateway device **100** uses a media access control (MAC) address and Internet Protocol (IP) address of the router (or access point) **120**, the local client devices **140**A-C, or the streaming device **150** in the LAN as opposed to using its own MAC address or IP address. After the gateway device **100** is installed, the gateway device **100** communicates with the central server **180** or monitors the packets to and from the LAN to determine IP addresses or MAC addresses of the router (or access point) **120**, the local client devices **140**A-C or the streaming device **150**. The gateway device **100** then uses the IP addresses or MAC address of the router (or access point) **120**, the local client devices **140**A-C or the streaming device **150** to communicate over the WAN.

In one embodiment, the gateway device **100** detects the Dynamic Host Configuration Protocol (DHCP) message passing through. If the DHCP message is detected, the gateway device **100** uses the IP address and the MAC address included in the DHCP message. If the DHCP message is unavailable, the IP address and the MAC address of the router (or access point) **120**, local devices **140**A-C or the streaming device **150** may be extracted from packets transmitted via the gateway device **100**. After determining the MAC address of a router (or access point) **120**, local client devices **140**A-C or the streaming device **150** that was accessing the WAN (hereinafter collectively referred to as the "established LAN devices"), the media streaming module **220**, **320** of the gateway device **100** uses the IP address previously allocated to the established LAN devices and the MAC address of the established LAN devices to communicate over the WAN.

The gateway device **100** remembers the MAC address of the router (or access point) **120**, the local client devices **140**A-C or the streaming device **150** by monitoring the packets from the established LAN devices. The extracted MAC addresses are used by the gateway device **100** in the DHCP message to first get an IP address from the ISP or MSO, and then later to communicate over the WAN. The central server of the ISP or the MSO may map the same MAC address to the same IP address, a new IP address need not be created to accommodate the gateway device **100**. That is, the gateway device **100** may use the IP address previously allocated to the established LAN devices.

By using the MAC address and IP address of the established LAN devices, the configuration and installation procedure of the gateway device **100** may be simplified because the installation procedures associated with a new MAC address may be obviated. Using the MAC address and IP address of the established LAN device is also advantageous because the ISP or the MSO managing user's access to the WAN need not allocate a separate IP address to the MAC address of the gateway device **100**. The reuse of the IP addresses allows the ISP or the MSO to reduce the number of IP address range needed to support its services.

The gateway device **100** stores the IP address and the MAC address of the established LAN device. Therefore, even after the established LAN device is deactivated or disconnected from the LAN, the gateway device **100** may continue to use the MAC address of the established LAN device without interruption. In one embodiment, the gateway device **100** may store a list of the IP addresses and the MAC addresses of

the established LAN devices, and change the IP address or the MAC address being used when one IP address or MAC address causes conflicts with other network devices or other problems. The list of IP addresses and the MAC addresses may be modified by monitoring the DHCP message or packets transmitted via the gateway device **100**.

In one embodiment, the gateway device **100** uses the IP address and the MAC address of the established LAN device that are detected most recently. By using the device that is detected most recently, the reliability of the communication to and from the gateway device **100** is increased because the gateway device **100** is less likely to use stale IP addresses or MAC addresses. If the gateway device **100** detects a new IP address or a MAC address while the streaming is in progress, the previous IP address and the MAC address are used until the streaming stops.

In one embodiment, the gateway device **100** also performs network address translation (NAT) to ensure that packets are properly routed to the established LAN device and the media streaming module **220**, **320**. The gateway device **100** and the established LAN device share the same IP address and the MAC address. Therefore, to route the packets properly, the gateway device **100** keeps track of the packets sent to the WAN via the gateway device **100** by storing information on the communication to the WAN. When packets arrive at the gateway device **100** from the WAN, the gateway device **100** determines whether the packets should be routed to the LAN or the media streaming module **220**, **330** based on the stored information. If the gateway device **100** determines that the packets should be routed to the network devices in the LAN, the gateway device **100** sends the packets to the router (or access point) **120**.

If the gateway device **100** determines that the destination of the packets are media streaming module **220**, **320**, the packets are sent from the modem module **240**, **340** to the media streaming module **220**, **320** via the dedicated channel **230** or the network switch **330**, as explained above with reference to FIGS. **2** and **3**.

The media streaming module **220**, **320** may send packets to the modem module **240**, **340** for transmission of the packets to the remote client device **170**, the central server **180**, or the local client devices **140**A-C in the network. The media streaming module **320** may send packets directly to local client devices **140**A-C via network switch **330**. When sending the packets from the media streaming module **220**, **320**, the modem module **240**, **340** may insert the IP address and the MAC address of the established LAN device as the source address of the packets. The modem module **240**, **340** also keeps track of the packets sent by the media streaming module **220**, **320** to determine if a packet received from the WAN or the LAN is to be sent to the media streaming module **220**, **320**.

Discovery of Media Streaming Devices

Conventionally, the media streaming devices is discovered by broadcasting of discovery requests from the local client devices on the LAN, and the media streaming devices responding to the discovery requests. For example, in FIG. **1**, the local client devices **140**A-C broadcast discovery requests on the LAN. The streaming device **150** on the LAN receives the discovery requests and responds to the request by unicasting a response to local client devices **140**A-C that broadcasted the discovery requests. After the local client devices **140**A-C receives the response from the streaming device **150**, the communication is established between the local client devices **140**A-C and the streaming device **150**.

The gateway device **100**, however, is located outside the LAN. Therefore, the gateway device **100** may not be detected or discovered by the local client devices **140**A-C using such conventional methods. Therefore, a different mechanism may be used to establish connection between the gateway device **100** and the local client devices **140**A-C on the LAN.

In one embodiment, the local client devices **140**A-C send unicast discovery requests to the WAN to establish connection with the streaming devices outside the LAN. The discovery requests may be sent to a global IP address of a network device in the WAN. Alternatively, the discovery requests may be sent to a fake global IP address in the WAN. The gateway device **100** monitors a port used for sending such requests from the local client devices **140**A-C and captures the discovery requests from the LAN. The local IP addresses of the local devices **140**A-C sending out the discovery requests is extracted from the discovery requests. The gateway device **100** may then establish communication with the local client devices **140**A-C using the local IP addresses obtained from the discovery requests.

Automatic Detection of Surrounding Network Environment

In one embodiment, the gateway device **100** automatically detects connections to the gateway device **100** and changes its modes of operation. The gateway device **100** may have more than one mode of operation: a gateway mode providing a gateway function and the media streaming function, a media streamer mode providing only the media streaming function, and a standby mode in which the gateway device **100** performs no operation.

If signal is detected in the LAN connector **260** but not in the WAN connector **268**, the media streamer mode is enabled. In the media streamer mode, the gateway device **100** is placed in the LAN environment. The gateway device **100** functions like other network components in the LAN, and uses its own MAC address to identify itself and communicate via the LAN.

On the contrary, if the gateway device **100** detects signals in both the WAN connector **268** and the LAN connector **260**, the gateway mode is enabled. In the gateway mode, the gateway device **100** uses the MAC address of the established LAN devices to communicate with the WAN, as explained above in detail.

If no signal is detected in both the WAN connector **268** and the LAN connector **260**, the standby mode is enabled. In the standby mode, the gateway device **100** monitors the LAN connector **260** and the WAN connector **268** for signals so that the gateway device **100** may switch to the media streamer mode or the gateway mode after communication between the gateway device **100** and the LAN or the WAN is enabled.

In one embodiment, the gateway device **100** checks the connection status of the LAN connector **260** and the WAN connector **268** periodically or whenever the gateway device **100** is restarted. If a change in the connection status is detected, the gateway device **100** changes its mode accordingly.

The gateway devices described herein need not implement all of the features described above. That is, the gateway device may selectively implement the features of (1) providing media streaming functionality to the gateway device, (2) IP/MAC address spoofing, (3) discovering the media streaming devices, and (4) automatic detection of surrounding network environment. These features are distinct from each other; and therefore, implementation of one feature does not necessarily require implementation of the other features. Moreover, the features to be enabled in the gateway device may be different depending on the modes of the gateway device.

The foregoing description of the embodiments of the invention has been presented for the purpose of illustration; it is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Persons skilled in the relevant art can appreciate that many modifications and variations are possible in light of the above disclosure.

What is claimed is:

**1**. A first device for providing a media stream to a second device, the first device comprising:

an input interface configured to receive audio/visual signals from a media source;

a local area network interface to a local area network;

a wide area network interface to a wide area network;

a media streaming module disposed within the first device and coupled to the input interface, wherein the media streaming module is configured to create the media stream from the audio/visual signals received from the input interface, wherein the media streaming module comprises a host port interface, and wherein the media streaming module is configured to format the created media stream into network packets that are routable on at least one of the local area network and the wide area network and to encapsulate the network packets into an interface format that is compatible with the host port interface; and

a modem module disposed within the first device, wherein the modem module is coupled to the wide area network interface to provide a gateway between the local area network and the wide area network, wherein the modem module comprises an external memory interface coupled to the media streaming module via an HPI-EMIF bridge that provides a dedicated communications channel between the media streaming module and the modem module, and wherein the modem module is configured to receive the encapsulated network packets from the media streaming module via the HPI-EMIF bridge, to decapsulate the network packets, and to transmit the decapsulated network packets containing the media stream via at least one of the local area network interface and the wide area network interface.

**2**. The device of claim **1** wherein the modem module is further configured to form network data packets based upon data received from the at least one of the first and second network interfaces, to encapsulate the network data packets into the interface format that is compatible with the host port interface, and to transmit the encapsulated network data packets to the media streaming module via the dedicated communications channel.

**3**. The device of claim **1** wherein the media streaming module and the modem module are implemented with a common processing device.

**4**. The device of claim **1** wherein the modem module is further configured to obtain a network address that was previously allocated to another device operating on the local area network and to use the previously-allocated network address during subsequent communications.

**5**. A method for transmitting a network stream representing audio/visual signals received from a media source to a second device using a first device that communicates via a first network and a second network and that comprises a media streaming module having a host port interface and a gateway module having an external memory interface that has a direct connection to the host port interface via an HPI-EMIF bridge, and wherein the gateway module, the method comprising:

receiving the audio/visual signals from the media source;

processing the audio/visual signals to create the media stream at the media streaming module of the first device, wherein the processing comprises formatting the media stream into network packets that are compatible with at least one of the first network and the second network and encapsulating the network packets into an interface format that is compatible with the HPI-EMIF bridge;

providing the encapsulated network packets containing the media stream from the media streaming module to the gateway module of the first device via the HPI-EMIF bridge, wherein the gateway module extracts the network packets from the encapsulated network packets; and

transmitting the extracted network packets containing the media stream to the second device via at least one of the first and the second networks.

**6**. The method of claim **5** further comprising forming network data packets at the gateway module based upon data received from at least one of the first and second networks, encapsulating the network data packets into the encapsulated packet format at the gateway module, and transmitting the encapsulated data packets from the gateway module to the media streaming module via the HPI-EMIF bridge within the first device.

**7**. The method of claim **5** further comprising switching a communications channel within the first device between the media streaming module and the gateway module.

**8**. The method of claim **5** further comprising obtaining a network address that was previously allocated to another device operating on the first network and using the previously-allocated network address during subsequent communications.

**9**. The method of claim **8** comprising monitoring network traffic on the first network to determine the previously-allocated network address.

**10**. The method of claim **8** comprising detecting a dynamic host configuration message on the first network to determine the previously-allocated network address.

**11**. The method of claim **8** wherein the previously-allocated network address comprises an internet protocol (IP) address.

**12**. The method of claim **8** wherein the previously-allocated network address comprises a media access control (MAC) address.

**13**. The method of claim **5** further comprising receiving a discovery request from a third device operating on the first network.

**14**. The method of claim **13** further comprising detecting signals in the second network, setting a first operating mode if signals are received only in the first network, and setting a second operating mode if signals are received in both the first network and the second network.

**15**. A gateway device interfacing with a local area network and a wide area network that additionally provides a media stream to a remote device in response to audio/visual signals received from a media source, the gateway device comprising:

a media interface configured to receive the audio/visual signals from the media source;

a first network interface to the local area network;

a second network interface to the wide area network;

an HPI-EMIF bridge configured to provide a dedicated internal communications channel within the gateway device;

a media streaming module having a host port interface configured to transmit and receive data via the HPI-EMIF bridge, wherein the media streaming module is configured to receive the audio/visual signals from the media interface, to process the audio/visual signals to

create the media stream, to format the media stream into network packets compatible with at least one of the local area network and the wide area network, to encapsulate the network packets into encapsulated packets compatible with the HPI-EMIF bridge, and to transmit the encapsulated packets on the HPI-EMIF bridge within the gateway device; and

a modem module having an external memory interface configured to transmit and receive data via the HPI-EMIF bridge, wherein the modem module is coupled to the first and second network interfaces and is configured to provide a gateway between the local area network and the wide area network, wherein the modem module is further configured to receive the encapsulated packets from the media streaming module via the HPI-EMIF bridge, to extract the network packets from the encapsulated packets, and to transmit the network packets to the remote device via the at least one of the local area network and the wide area network.

**16**. The gateway device of claim **15** wherein the modem module is further configured to obtain a network address that was previously allocated to another device operating on the local area network and to use the previously-allocated network address during subsequent communications.

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